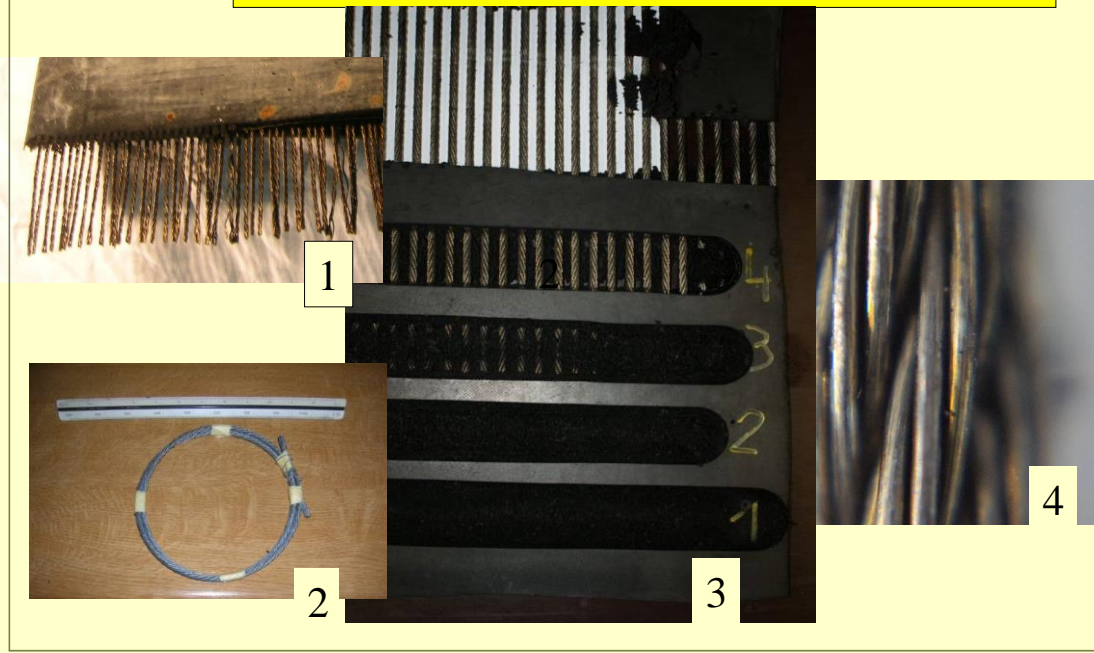


**Heavy Reinforced Conveyor Belts
including chloroprene (neoprene) belts
REPAIR and RECYCLING**

BTRC

Conveyor belts with steelcord



BTRC made two full scale programs, one on the repair and one on the recycling of the heavy reinforced conveyor belts.

B.T.R.C.

The repair and recycling technology for heavy reinforced conveyor belts was based upon the BTRC development using UHP (Ultra High Pressure) water jetting to pulverize the rubber in a one-step operation.

The repair and also the recycling program were done on full scale conveyors of some 2,2m wide and some 2cm thickness, reinforced with cables of dia. 6mm each 11mm. Some local repairs using textile reinforcement.

The main goal was to determine the most efficient parameters to obtain the highest speed of processing (cm²/sec) recto/verso with the minimum energy (kwh/kg) required and the best financial consequences.

In case of repair there was the speed of the operation which was the most important issue.

In case of the recycling of the conveyor belts there was another important issue. Beside the technical issues there was the quality of the recycled material as an important element to determine the best financial results. The quality of the recycled material and evidently the market price were an important last issue.

The (high) quality of these recovered products was evaluated on their market value (the re-use) e.g. steel cables, recovered rubber and some fluff.

Finally a proper technical design lay out was made one for the repair machinery and one for the recycling machinery of these conveyor belts.

The financial conclusions were brought together in a financial plan confirming the excellent ROI, EBITDA etc. flame retardant

Note:

The underground fire retardant chloroprene (neoprene) belts can be recycled.

B.T.R.C.

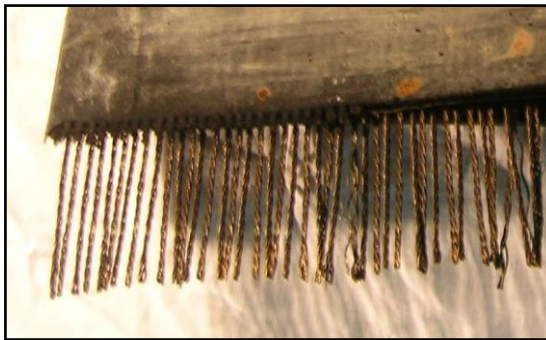
Recycled materials:

a. Steel cables:

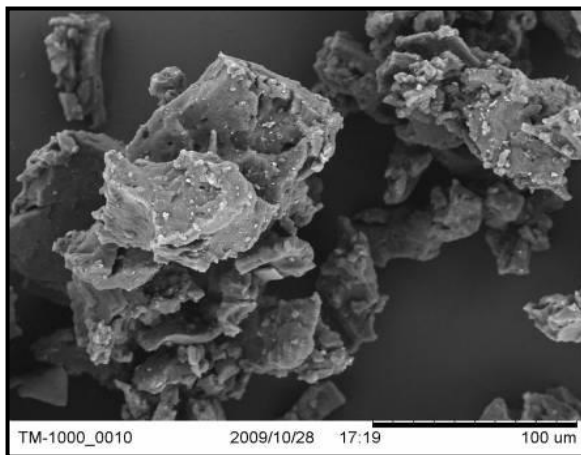
Steel cables undamaged and clean, rolled up.

Remark:

A very limited amount of cables were broken and needed to be scrapped.



- b. Pulverized rubber powder: reclaim quality, P.A.R. - Physically Active Rubber. The latter is a separate program for EOL OTR recycling, using UHP water jetting to pulverize EOL rubber directly into reclaim powder of some 400 μ m (40 mesh) max. Ready to be re-vulcanised on its own or in new compounds @ 50 or more phr.



B.T.R.C.

c. Textile fluff:

Some textile was recovered during the jetting.

BTRC presumes textile reinforcement was used only locally in some repair areas. This cleaned recovered textile fluff is proven to be a perfect reinforcing material in some new technical compounds.



Speed of operation (repair and / or recycling):

Basic set up 20 cm²/sec. up to 30 cm²/sec.

Increasing the number of UHP pumps consequently increases the speed of full recycling.

See also slide #35 of the technical presentation to show the interesting results of the naked cables after UHP jetting with different water pressure.

The recycling machinery.

BTRC has designed the machinery for container transportation for recycling locations anywhere in the world.

The operations should be done locally to avoid expensive transport.

Safety issues.

The UHP water jetting of some 4.200 bars with water jetting speed of some 850m/sec (Mach 2) is a dangerous operation and needs special precautions.

The machinery is designed for taking this important issue into consideration.

Green issues / CO₂ reduction.

The CO₂ reduction using the BTRC technology is basically the sum of 2 issues:

1. The CO₂ reduction due to the recycling of the steel components.
2. The CO₂ reduction due to the recycling of the rubber and fluff products.

B.T.R.C.

The re-use of the recycled rubber is a reduction of: 2,27 ton CO₂/ton rubber.

The re-use of the recycled steel is a reduction of: 1,90 ton CO₂/ton steel.

It is obvious that the total annual reduction of the CO₂ has to be calculated depending on the total tonnage recycled.

General EOL (end-of-life) rubber recycling.

BTRC made up a UHP water jetting technical report for EOL rubber products e.g. OTR's from dia 1.4m to dia 4m, tracks, fenders, oil& dredging hoses etc.

All parameters were listed in order of efficiency (speed of operation kg/hour) and energy savings (kW/kg powder).

This report is also including the analysis of the UHP water jetting effect on (EOL) rubber as a result of all 5 physically processes in and caused by the UHP water jetting, type of UHP pumps and jetting equipment.

Report available (228 pages).

B.T.R.C.

Summary of the test reports on the repair / recycling of heavy reinforced conveyor belts using the BTRC UHP water jetting.

Resume of tests reports

BTRC made up a test reports on the Repair and on the Recycling of Heavy Reinforced Conveyors belts.

Reports:

1. Basic research and tests related to the use of UHP water jetting to repair / recycle heavy reinforced conveyor belt.

16 pages

2. Test with UHP waterjet-cleaning on clearing (cleaning) of the steel cables on a large piece of conveyor belt of +/- 3m² on the BTRC test-bench in Puurs.

6 pages

3. Tests on recycled material from heavy reinforced conveyor belts, recycling using UHP water jetting.

- To get more detailed technical information on the quality of the recycled rubber powder and clean steel.
- To make SEM pictures of this powder
- To allow the production of compounds with this recycled rubber powder, testing and evaluating this compound.

10 pages

4. The production of a substantial amount, approx. 1.000kg rubber from the delivered conveyor belts using UHP water jetting to be used for further testing and marketing efforts.

8 pages

5. Observations and notes from prof Chr Guérin phd on the S.E.M. of the recycled rubber powder from the heavy reinforced conveyor belts.

1 page + SEM pictures.
